neutral user-specified values for critical cost drivers, it is essential to differentiate the cost-causative nature of the subsidized service, from that of other services.[13]

Staff questions how the utility of models should be evaluated when an incumbent local exchange carrier (ILEC) is offering both narrowband and broadband network components.[14] Any cost proxy model that is used for the purpose of pricing unbundled elements, pricing access charges, and computing universal service support should model *solely* the narrowband network elements that are necessary for delivering traditional voice telecommunications services and narrowband data services at currently acceptable quality levels. In its Recommended Decision, the Joint Board recommends that the scope of universal service include, among other things, "voice grade access in the frequency range between 500 Hertz and 4,000 Hertz, for a bandwidth of approximately 3,500 Hertz."[15] The separate fact that an ILEC may choose to *broaden* the scope of services that could be offered over its integrated network is irrelevant to these three purposes. The cost proxy model is in no sense intended to serve as a blueprint for what the ILEC is "supposed to" construct, but is appropriately hypothetical so as to eliminate the costs that ILECs are incurring for strategic reasons that are outside the realm of the three regulatory proceedings.

As discussed in detail in ETI's August Report,[16] the evaluation of the relationship of the scope of service to the cost proxy model also raises the issue of how to reflect appropriately the economy of scale and scope associated with an ILEC's network. Neither the BCPM, the Hatfield Model 3, nor the TECM fully reflect the economies of scale enjoyed by an ILEC. The appropriate method for recognizing the economies of scale is (1) to compute separately (a) the stand-alone cost of the services being subsidized (primary residence and single-line business) and (b) the stand-alone cost of all other services, i.e., the non-subsidized services; (2) to compare the sum of these two costs with the cost of a combined network; and (3) to flow back to all lines a proportionate share of the savings.

If this methodology is not adopted (that is, if economies of scale and scope are only indirectly — and incompletely — modeled), then it becomes imperative that the cost proxy model adopted by the FCC include *all* lines (both subsidized and non-subsidized lines) in order to at least partially reflect the economies of scale and scope that the ILEC enjoys through the provision of all services over a single integrated network.

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13. See *The Cost of Universal Service, A Critical Assessment of the Benchmark Cost Model*, Baldwin, Susan M. and Lee L. Selwyn, April 1996, pp. 13-16.

14. Staff Paper at ¶ 10.

15. *Recommended Decision*, at ¶ 48.

16. *Converging on a Cost Proxy Model for Primary Line Basic Residential Service*, Baldwin, Susan M. and Lee L. Selwyn, Economics and Technology, Inc., August 1996, pp. 105-110, ("ETI August Report").

1.4 The FCC, in concert with the state PUCs, should take affirmative steps to establish the key inputs for cost proxy models

The FCC asks whether it should take steps to establish certain inputs for the cost proxy models.[17] Not only is it an appropriate role for the FCC to establish the input values for a model used to determine universal service support, UNE pricing, and rates for access charges, but it is a critically important one. Regardless of which model (or combination of modeling attributes) is chosen, the integrity of the results depends on reaching closure on the appropriate input variables. In many instances, the models' sponsors, by "hardwiring" inputs or specifying some number of default choices, have "recommended" their best judgments (or desired outcomes). With each new release, there has also been a growing number of user-specified inputs.[18] Regardless of whether a particular model recommends a specific input or leaves it completely flexible, the FCC still has an obligation to determine which of these recommendations — or some other, independently derived value — most appropriately "fits" the purpose for which the model is designed. Even though analysis continues regarding the latest versions of the competing models, the FCC (and state regulators) should begin to resolve some of the most critical cost drivers that — regardless of the model selected for use in any or all of the three proceedings — should be established by policy makers and not by model sponsors.

The FCC should look to the example of the California USF proceeding, in which the California Public Utilities Commission (CPUC) had to chose establish a universal service funding mechanism that met the state's public policy objectives.[19] Presented with two competing models, the CPUC selected one (that of incumbent LEC Pacific Bell) but required major revisions in a number of critical cost drivers, replacing them with values that were more consistent with the CPUC's public policy objectives. With these changes, the universal service support level determined by the model was reduced precipitously from the $1.7-billion that Pacific Bell estimated to $584-million.[20]

Inputs generally fall into two categories: engineering and economic/financial. Examples of the engineering decisions are: the proportions of aerial, underground, and buried plant for the various density zones and plant types; the sizing of the distribution plant; the percentages of structure costs shared among utilities; etc. Examples of the

17. The fact that the inputs are "user-specified" or "variable" does not mean that they are not susceptible to determination, and for purposes of coming to closure, it is regulators, not model developers, who ultimately must determine the values for these inputs.

18. There are certain exceptions to this trend. The newest version of the BCPM "hardwires" the switch discounts and switch fill factors.

19. CPUC D.96-10-066, R.95-01-020-021, ("*Universal Service Decision*"), October 25, 1996.

20. *Id.* at 4.

economic/financial inputs include depreciation lives; capital structure; plant-related and non-plant-related expense factors. While many of these inputs sound as though they have a purely factual "answer," there are, in fact, important public policy judgments that must also be made in determining their values. In specifying inputs and design criteria, the FCC must remain focused on the overarching principle of economic efficiency, which should guide the ultimate determination of all of the inputs and algorithms in a cost proxy model being used for public policy purposes: that is, all inputs should be consistent with the development of a model that reflects the forward-looking economic costs of an efficiently provided network designed to supply basic telecommunications services.

To begin moving forward, the FCC also needs a systematic approach to resolving the open questions regarding model inputs and design criteria. The fact that the number of user-specified inputs has been growing with each new release of the various models is a mixed blessing for regulators. There are now potentially hundreds of decisions for policy makers to make about the appropriate values to use for the user-specified inputs, which creates a simulations opportunity and regulatory burden. However, there are a much smaller number of "key" inputs, that is, inputs that are major cost drivers within the model. Clearly, it makes sense to devote the greatest effort to the accurate specification of these "key" inputs and to give a somewhat lesser priority to inputs that have only a minor impact on the model's results.

1.5 The trend toward higher funding requirements is a source of public policy concern

In analyzing successive versions of the BCM (now BCPM) and Hatfield Models, there is a disturbing trend. As shown in Table 1.1, as "refinements" are made in each success version, the bottom line of each of the long-standing models has consistently increased. While we by no means advocate a purely results-driven approach, as the Joint Board has recognized, there are significant public policy implications to the overall size of the USF requirements, and these are considerations fairly and appropriately before the FCC.

It is also noteworthy that there is a continued divergence between the results generated by competing models. As shown in Table 1.2, in each version, the model proffered by the incumbent LECs (BCM, BCM2, BCPM) consistently yields a significantly higher funding requirement than the IXC-sponsored Hatfield Model. As we explain throughout this report and in our October Report, much of this divergence is attributable to widely varying input assumptions regarding key cost drivers.

Table 1.1

Cost Proxy Model Results Increase USF Support

Texas
$30 Threshold

Release	**Companies**	**USF Support**
BCM	SWBT and ICOs	$407-million
BCM2	SWBT and ICOs	$464-million
BCPM	SWBT and ICOs	In Progress
HM 2.2.2	SWBT	$49-million
HM3	SWBT	$79-million

Table 1.2

ILEC Model and IXC Model Continue to Yield Different Results

Texas
$30 Threshold

	BCPM	**HM3**
SWBT	$400-Million	$79-Million
ICOs	In Progress	$167-Million
Total State	In Progress	In Progress

2 CARRYING CHARGE

2.1 The Commission should establish a capital structure that reflects the actual risks ILECs now confront, and not the speculative risks associated with a far-in-the-future vision of a fully competitive market

Regardless of the cost proxy model chosen, the capital structure that the FCC establishes will be a critical cost driver. Some of the ILECs contend that the capital cost inputs to a cost proxy model should reflect the market-based cost of money for new investment.[21] We disagree. As a threshold matter there is no reason to designate a different capital structure for the three regulatory purposes — access charges, UNE pricing, and USF support. The components of capital structure (e.g., debt/equity ratio; cost of debt; cost of equity) should, in all three instances, reflect the virtual monopoly and the vast infrastructure enjoyed by ILECs. ILECs have pervasive market share, the ability to shift costs among numerous services and are protected by their sheer size. The ILECs own extensive joint plant that is common to their provision of competitive and monopoly services which gives them a unique opportunity to use their common plant as a platform for offering nonregulated services.

Although the prices and universal service recovery mechanisms that will result from the deliberations in the three proceedings are intended to be set so as to promote competition, it is critical to acknowledge that competition is many years in the future. During what can only be a long transition to a fully competitive local market, it will be the ILECs (and not the new entrants) that will be the primary recipients of any universal service mechanism and it will be largely the ILECs that will be providing monopoly network components. This is an important factor as the FCC evaluates the relevant capital acquisition costs. Furthermore, the alleged risk to incumbent local carriers associated with the Telecommunications Act of 1996 (e.g., entry by competitors into the local market) is more than offset by numerous opportunities for ILECs to earn new revenues that would be outside the

21. See US West Comments at 28-29, Pacific Bell Comments at 13.

scope of any of the contending cost proxy models (e.g., video services, interLATA revenues, overseas ventures, vertical services, etc.).[22]

Those opposed to using capital structures based upon the decisions of state and federal regulators rely in part on the language of the Joint Board's Recommended Decision regarding new entrants:

> We find that forward-looking economic costs should be used to determine the costs of providing universal service. Those costs *best approximate the costs that would be incurred by an efficient competitor entering that market.*[23]

For example, US West has argued that the 45% debt - 55% equity structure that is used as a default structure in the Hatfield Model Version 2.2.2 "is indicative of a monopoly provider of telecommunications service" and therefore is inconsistent with the Recommended Decision's requirement to apply a structure that would apply to a new entrant.[24](The Hatfield Model 3 uses the same default capital structure as the previous version.) Indeed much of the debate about capital structure during the Joint Board's recent cost proxy model workshop revolved around the appropriate interpretation of the above-quoted guidance in the Recommended Decision.[25] Along the same lines, Christensen Associates, on behalf of the United States Telephone Association, has argued that "the fact that the models must take the perspective of an efficient entrant in a competitive market means that the cost of capital and depreciation rates should reflect this competitive environment. In other words, regulatory-prescribed cost of capital and depreciation rates will not be appropriate under these conditions."[26]

To give credence to these positions would yield results that are plainly at odds with the purposes of the cost proxy models. In fact, the FCC has offered some guidance on this critical input, as it relates to UNE pricing. In its *First Interconnection* decision, the FCC concluded that:

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22. ETI has identified between $19.0-billion and $31.0-billion in new revenue opportunities available to ILECs under the current regulatory/competitive environment through the provision of second lines, vertical services, interLATA long distance, advanced digital/broadband, and yellow pages directory advertising. Kravtin, Patricia D. and Lee L. Selwyn, *Assessing Incumbent LEC Claims to Special Revenue Recovery Mechanisms: Revenue opportunities, market assessments, and further empirical analysis of the "Gap" between embedded and forward-looking costs*, CC Docket No. 96-262, January 29, 1997.

23. Recommended Decision at ¶ 270, emphasis added.

24. Reply Comments of US West, Inc. to Recommended Decision, CC Docket No. 96-45, January 10, 1997, at 19.

25. Joint Board Cost Proxy Model Workshops, January 14-15, 1997, CC Docket No. 96-45.

26. Christensen Associates, *Economic Evaluation of Proxy Cost Models for Determining Universal Service Support*, January 9, 1997, CC Docket 96-45, at 9.

> [T]he currently authorized rate of return at the federal or state level is a reasonable starting point for TELRIC calculations, and incumbent LECs bear the burden of demonstrating with specificity that the business risks that they face in providing unbundled network elements and interconnection service would justify a different risk-adjusted cost of capital or depreciation rate. *These elements generally are bottleneck, monopoly services that do not now face significant competition.*[27]

In the context of the universal service proceeding, the relevant service is the *retail* local exchange service, and, therefore, we must consider whether the above-quoted conclusion of the FCC applies to Docket 96-45.[28] However, in considering the competition that ILECs may face, it is critical to differentiate between facilities-based competition and resale-based competition. There simply is no meaningful competition for basic local exchange service from facilities-based providers. The stay of the FCC's TELRIC decision simply postpones the elimination of major market barriers to new entrants and thus delays the likely entrance of new carriers into the local market. Furthermore, the competition posed by resellers presents no risk to ILECs' recovery of their capital. Rates for resold elements are based upon an examination of the avoided costs, and the avoided costs include expenses such as marketing and customer support, and exclude capital costs. Indeed, according to the statutory guideline of the Telecommunications Act, the rates set for resale should render the ILEC indifferent between providing an element on a retail or resale basis.

The FCC has also stated that the "forward-looking costs of capital (debt and equity) needed to support investments required to produce a given element shall be included in the forward-looking direct cost of that element."[29] The FCC's preliminary characterization of the appropriate cost of capital is also reflected in part in its Access Charge Reform NPRM:

> Although we found in the *LEC Price Cap Performance Review Order* that there was not sufficient reason for reducing access rates in the 1995-96 access period for changes in the cost of capital, the incumbent LECs' cost of capital may now be less than 11.25%. ... On the other hand, incumbent LECs face potential competition as a result of the Act that they did not face previously. This potential competition could increase the risks facing the incumbent LECs, and thus increase

27. *First Interconnection Order*, CC Docket 96-98, ("*First Interconnection Order*") at ¶ 702, emphasis added. *Iowa Utilities Board et. al. v. FCC*, No. 96-3321 and consolidated cases (8th Cir., Oct. 15, 1996), *partial stay lifted in part, Iowa Utilities Board et. al. v. FCC*, No. 96-3321 and consolidated cases (8th Cir. Nov. 1, 1996).

28. In any case, contrary to USTA assertions (USTA Comments at 21), it is clear that the FCC has *not* agreed that the use of authorized returns as hurdle rates for ILEC investments would "inevitably result" in underperforming investments, since the FCC has expressly placed the burden on ILECs to demonstrate that their authorized returns must be adjusted upward to reflect increased business risk.

29. *First Interconnection Order* at ¶ 691.

their cost of capital, thus mitigating to some extent the factors suggesting that incumbent LECs' cost of capital has decreased since 1990.[30]

The FCC should distinguish between a vision of competition and the actual arrival of competition. There will be a long lag time between when the starting gun goes off and when new entrants catch up (if ever) to the ILECs. Rewarding ILECs for competition that is in the distant future will simply provide a transitional windfall to ILECs that is unwarranted, anticompetitive, and anticonsumer.

In its Access Charge Reform NPRM, the FCC also observed:

> We also note that evolving competition may make it appropriate to assign different costs of capital to different services, reflecting differences in competition and higher risks in transport, switching, and loop services respectively.[31]

As we have previously noted, subsidized services exhibit a far more stable, predictable, and *less competitively impacted* demand than many other ILEC services. We have suggested, for example, that this distinction be reflected in the use of different "fill factors" to reflect the different plant utilization rates that subsidized and non-basic services may require. Similarly, we have also noted that different depreciation rates, based upon different economic life assumptions, may also be appropriate, with lower rates/longer lives being ascribed to those services that tend to exhibit the most stable demand. The treatment of cost of capital as between noncompetitive subsidized services and discretionary or competitive services is entirely analogous.

While an ILEC's average cost of capital may be higher relative to market levels due to the prospect of increased competition, the *components* of the company-wide average can be disaggregated as between stable and variable demand services. To the extent that an ILEC's cost of capital may be on the rise due to the arguably growing level of competition, that increase is by definition attributable to the competitive segment of the ILEC's overall service mix. Indeed, new entrants that do not provide core basic telephone services will not be able to achieve a cost of capital as low as that for the ILECs precisely because such firms do not have the large mass of highly stable services upon which to leverage their competitive initiatives. Accordingly, it is both economically valid as well as sound public policy for the Commission to disaggregate and apply differential costs of capital to individual ILEC services, with the lower cost levels being attributed to the noncompetitive core services.

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30. *In the Matter of Access Charge Reform*, CC Docket No. 96-262, FCC 96-488, Notice of Proposed Rulemaking, released December 24, 1996 ("*Access Charge Reform NPRM*"), ¶ 228.

31. *Id.*, at ¶ 228.

The ILECs contend that the cost of capital should be based upon an *expectation* of competition. In a state TELRIC proceeding, an ILEC witness stated:

> [I]t seems to me that the assumption that the FCC had in mind when valuing the investment in the network on a going-forward basis was that it was a competitive market assumption. Indeed the entire Telecommunications Act and the FCC order is designed to bring about competition in telecommunications. ... Well, it would certainly be inappropriate to use a cost of capital that is based on no competition or very little competition or a regulatory model of some type when one is using a competitive assumption when valuing the investment.[32]

Certainly the vision of the Telecommunications Act and of the FCC's related orders is based upon a hope for competition, but how, when, and even whether that competition will materialize is still unknown. Until there is solid evidence of competition, imputing a "competitive" level of risk will result in a huge financial windfall to the ILECs. It is inappropriate to inflate the funding requirement for USF support (or the rates for bottleneck services) by incorporating a cost of capital based on an expectation of competition that may never materialize, and to do so may create disincentives to the very competitive entry it prematurely anticipates. Furthermore, while the ILECs are quick to point to the risk they perceive in opening up of their monopoly markets to competitors, the ILECs conveniently ignore the fact that they themselves have the opportunity to enter new markets. Investors consider not only the risk but also the new opportunities. The FCC has indicated that it "intend[s] to re-examine the issue of the appropriate risk-adjusted cost of capital on an ongoing basis, particularly in light of the state commissions' experiences in addressing this issue in specific situations."[33] Just as the FCC can make this periodic adjustment, it can also revisit the cost of capital based upon actual experience in achieving competition. Thus, there is no need to prematurely anticipate longer-term changes in competition in making current judgments regarding the appropriate capital structure to reflect in a cost proxy model.

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32. Mass. D.P.U. 96-73/74, 96-75, 96-80/81, 96-83, 96-94, Phase 4, Consolidated Petitions for Arbitration, released December 4, 1996, ("*Mass Arbitration Decision*") at 41, citing Tr. 8, at 102 (Dr. Vander Weide on behalf of NYNEX). Responding to this argument, the Massachusetts DPU concluded:

> There is not yet a competitive market for unbundled network services, but there will be one shortly. We need a surrogate to describe the risks of that to-be-developed market, and we choose to rely on one of the most liquid and well publicized markets, the stock market, whose performance is often measured by the S&P 400. *Mass. Arbitration Decision*, at 49.

There is a certain lack of logic of this PUC's conclusion which is premised on seeking "to estimate the cost of equity for a service offering that does not yet exist in a marketplace that is about to come into existence." *Id.* at 50. This approach errs on the side of assuming that the competitive marketplace not only will develop but will arrive sufficiently soon that one can base decisions assuming that it already exists.

33. *Local Competition Order* at ¶ 702.

The capital structure in the BCPM exemplifies the ILECs' position regarding capital structure. The BCPM default is 32.8% debt and 67.2% equity. Yet, this is completely at odds with the capital structure of actual ILECs: In a recent state proceeding (still ongoing) one of the BCPM's sponsors has requested a debt/equity ratio of 44%/56%.[34] Moreover, as discussed above, there is reason to expect that the ILECs' capital structure will change any time soon (particularly while competition is still at minimal levels). Table 2.1 below compares the default capital structures in the BCPM, Hatfield 3, and TECM models.

ETI believes that the FCC should set a capital structure similar to the Hatfield 3 default because it is the closest to state and federal reviews of capital structure (see October Report at 33) and for the reasons stated above.

Table 2.1

Default Capital Cost Comparison

	Ratio	Cost	Weighted Costs
BCPM			
Debt	32.82%	7.85%	2.58%
Equity	67.18%	13.12%	8.81%
Total	100.00%		11.39%
HM3			
Debt	45.00%	7.70%	3.47%
Equity	55.00%	11.90%	6.55%
Total	100.00%		10.01%
TECM			
Debt	40.00%	8.50%	3.40%
Equity	60.00%	12.00%	7.20%
Total	100.00%		10.60%

34. Direct Testimony of Peter C. Cummings on behalf of US West Communications, Inc., Idaho Public Utilities Commission, Case No. USW-S-96-5, at Exh. 8, p. 1.

ETI ran the Hatfield 3 with the unrealistic BCPM default values (using Texas data). As illustrated in Table 2.2 below, this change resulted in a 29.3 percent increase in USF support for SWBT Texas and a 16.9 percent increase in statewide USF support (assuming a $30 threshold).

Table 2.2

Impact of Using the BCPM Capital Structure in the HM3

USF Support: Texas
$30 Threshold

	Default HM3	**HM3 using BCPM lives**	**Percent Increase**
ICO	$166,931,221	$185,298,614	11.0%
SWBT	$79,132,815	$102,314,105	29.3%
Total	$246,064,046	$287,612,719	16.9%

2.2 Depreciation rates in a forward-looking cost proxy model being used to cost out monopoly services should not reflect ILECs' capital investment plans being undertaken for competitive purposes

Depreciation is another key variable input that significantly affects the overall cost determined under a cost proxy model. The debate about depreciation rates is similar to the capital structure debate. The ILECs argue for relatively shorter lives, contending that an assumption of frequent replacement of plant would more realistically reflect the attributes of a competitive market.[35] One proponent of short lives stated that:

> [D]epreciation rates authorized by regulatory bodies are likely to be too low to reflect the forward-looking competitive environment. Again it is inconsistent with the Joint Board's criteria and economically meaningless to assign a different depreciation rate for supported services than for the rest of the company.[36]

35. See, e.g. Pacific Bell's Comments at 14.

36. Christensen Paper, at 16.

It is not only appropriate, but essential that depreciation lives be thought of differently for the services in question versus the ILECs' competitive interests. State regulators have examined depreciation in the context of general rate cases, TELRIC proceedings, and universal service proceedings. Their analysis and findings may offer guidance to the FCC. For example, the Massachusetts DPU concluded that:

> [T]he projection lives prescribed by the FCC in its last represcription of NYNEX's depreciation rates are the kind of forward-looking projection lives required in a TELRIC study. Accordingly, as suggested by the Attorney General, we direct that these lives, rather than those used in either the NYNEX model or the Hatfield model, be incorporated into NYNEX's compliance filing when calculating the rates for unbundled network elements using the NYNEX TELRIC model.[37]

The Public Service Commission of Utah rejected US West's increase for approval of increased depreciation expenses:

> Notwithstanding unresolved technology and economic issues, this case compels us to decide the important policy issue of risk distribution between current and future consumers and between current ratepayers and shareholders. We acknowledge a process of technology substitution which results not only in the premature retirement of existing assets, but in an opportunity for the Company to enter non-traditional media distribution and content businesses in entirely new, and likely unregulated, service markets. This shift in technology and in service markets compels recognition of the risk and obligation of current and future consumers of voice service to fund Company investments in a broadband network providing video and multimedia services for which there is uncertain demand.[38]

The state regulators in Utah went on to conclude that there was no record of demand for new services (i.e., what consumers would consume under realistic assumptions of price), and that US West had failed to provide an economic analysis of the cost of constructing a broadband or wideband network. The Utah Public Service Commission determined that it could not "justify burdening current ratepayers further with the costs caused by premature retirement of assets replaced to offer competitive services in the future" and also concluded that "[a]s with other competitive companies, the potential revenues and returns from new competitive services will have to provide USWC management and shareholders with the confidence and incentive to invest."[39] Although this particular proceeding concerned a request by an ILEC to raise rates to recover a proposed increase in proposed depreciation

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37. *Mass. Arbitration Decision*, at 56.

38. Public Service Commission of Utah, Docket No. 95-049-22, *In the Matter of the Request of US West Communications, Inc. for Approval of Changed Depreciation Rates*, issued April 4, 1996, at 22.

39. *Id.*, at 23.

expenses, the logic is germane to all three regulatory proceedings, in which a *narrowband* network is being modelled.

Staff also posits that "[i]t may be important to determine whether depreciation rates should differ depending on what services carriers expect to provide over an existing facility or the facility that will replace the existing facility," and follows up this premise with the following question: "Because broadband service may not be a supported service [in the context of universal service], should the depreciation rate used to determine the level of support for universal service differ from that used to price unbundled elements?"[40] Contrary to the implication of the Staff's question, broadband service is not *necessary* for unbundled elements, and thus there is no reason for different depreciation rates for unbundled elements and for computing universal service. Only if at some distant future time, ILECs are required to provide unbundled broadband components would this concern become relevant. Presently, however, in none of the three proceedings should the FCC's determination of the economically efficient depreciation rates be driven by ILECs' broadband deployment plans.

Some ILECs argue that the depreciation lives used in TELRIC studies should be specific to the UNEs sold to new entrants, rather than to the Company's plant as it is used to furnish services to its entire customer base.[41] Also, ILECs contend that new entrants — because they are sophisticated telecommunications users — demand the installation of specific technology, which in turn will shorten the lives of plant.[42] Neither of these arguments are persuasive. The ultimate customers of the plant — regardless of whether the ILEC provides the service directly through retail services or indirectly through wholesale services — serve the same body of customers. Similarly, it is the end users ultimately that are demanding specific functions and capabilities; new entrants are simply intermediaries. As is discussed later in this paper, different categories of customers may impose different requirements and thus it is entirely appropriate for the FCC to distinguish between depreciation lives necessary for primary residence lines from those that, for example, an ILEC may require for Centrex service.

As a threshold matter, the depreciation lives that are established for the monopoly services and elements that are being modelled for the purposes of all three proceedings should in no event be determined by a consideration of ILECs' competitive plans. The lives should differ, however, depending upon the type of demand being served. As is discussed in more detail below, the stable demand exhibited by primary residential service differs from the volatile demand of Centrex service and therefore depreciation lives for

40. Staff Paper at ¶ 62.

41. See e.g., Direct Testimony of Edward J. Marsh, Jr. on behalf of Ameritech Ohio, PUC Ohio Case No. 96-922-TP-UNC, December 9, 1996 at 4.

42. *Id.*, at pp. 11-12.

primary residential lines should be assumed to be longer than those for multiline business and Centrex lines. This distinction should only be applied, however, if it is carried out also in the TELRIC application.

In the BCPM, the ILECs continue to assume inflated and unrealistic depreciation rates. To show the bottom-line impact of the depreciation input, ETI ran the HM3 using the inappropriate BCPM default values for depreciation. As illustrated in Table 2.3, this single change resulted in a 12 percent increase in statewide USF support (assuming a $30 threshold) for Texas.

Table 2.3

Impact of Using BCPM Depreciation Lives in the HM3

USF Support: Texas
$30 Threshold

	Default HM3	**HM3 using BCPM lives**	**Percent Increase**
ICO	$166,931,221	$185,298,614	11.0%
SWBT	$79,132,815	$90,500,696	14.4%
Total	$246,064,046	$275,799,310	12.1%

The following table compares the default depreciation lives in the three models.

Table 2.4

Default Depreciation Life Comparison

Account	Description (HM3 used as Default)	BCPM	HM3	TECM
2112	Motor Vehicles	8.00	9.16	
2115	Garage Work Equipment	12.00	11.47	
2116	Other Work Equipment	14.00	13.22	
2121	Buildings	42.50	48.99	
2122	Furniture	16.00	16.56	
2123.1	Office Support Equipment	11.00	11.25	
2123.2	Company Comm Equipment		7.59	
2124	Computers	5.50	6.24	
2212	Digital Switching	10.00	16.54	12.00
2220	Operator Systems		9.94	
2232.2	Digital Circuit Equipment	8.50	10.09	
2351	Public Telephone		8.01	
	NID, SAI		12.00	
2411	Poles	30.00	16.13	30.00
2421-m	Aerial Cable - Metallic	12.50	16.80	15.00
2421-nm	Aerial Cable - Non-Metallic	19.00	22.11	20.00
2422-m	Underground - Metallic	11.50	21.17	15.00
2422-nm	Underground - Non-Metallic	19.00	22.87	25.00
2423-m	Buried - Metallic	14.00	19.86	15.00
2423-nm	Buried - Non-Metallic	19.00	24.13	25.00
2426-m	Intrabuilding - Metallic		15.64	
2426-nm	Intrabuilding - Non-Metallic		23.65	
2441	Conduit Systems	50.00	51.35	50.00
	Average Non-Metallic Cable		23.36	
	Trunking			15.00
	Termination			15.00
2111	Land	0.00		
2114	Special Purpose Vehicles	10.00		

Notes:

(1) BCPM default lives are based on LEC industry data survey requesting forward looking lives.

(2) Hatfield default values are based on average projection lives (adjusted for net salvage value) determined by the three- way meetings between the FCC, State Commission and ILECs) for the RBHCs and SNET.

(3) TECM default lives taken from Appendix A, Section 7, p. 1 of TECM documentation accompanying FCC submission.

2.3 Expenses should be those specifically required for the relevant services

Another critical component of the translation of investment into monthly costs is the treatment of plant-related and non-plant-related expenses. The Act states, in reference to universal service:

> A telecommunications carrier may not use services that are not competitive to subsidize services that are subject to competition. The Commission, with respect to interstate services, and the States, with respect to intrastate services, shall establish any necessary cost allocation rules, accounting safeguards, and guidelines to ensure that services included in the definition of universal service bear no more than a reasonable share of the joint and common costs of facilities used to provide those services.[43]

In its proposed universal service cost proxy model in California, Pacific Bell estimated the shared and common costs at $5.00 per line, and subsequently increased that estimate to $6.70 per line.[44] The PUC revised that number to $2.00 to safeguard against possible cross-subsidy in compliance with the Act.[45] The BCPM Sponsors show a sum of at least $5.06 per line for some of the non-plant-related expenses: $2.15 for "general and administrative functions" (Account 6720); $2.42 for customer support (Account 6620); $0.35 for marketing (Account 6610) and $0.14 for executive and planning expense (Account 6710)[46] Before aggregate amounts can be appropriately translated to a monthly per line amount, however, it is critical for the FCC to examine the individual categories of expenses that are being proposed for inclusion. By way of illustration, Account 6720 includes activities that should be excluded in runs used for any of the three proceedings such as external relations and lobbying. Absent the filing of information that is more detailed than the submission made on January 31, 1997, by the BCPM sponsors (which lacks even subaccount data), it is impossible for the FCC to evaluate whether these proposed expenses are properly included in a forward-looking cost proxy model.

The Joint Board recommends that single-line businesses be eligible for universal service support. It appears that the expenses that are identified in the BCPM filing do not reflect an estimate of the per-line expenses based upon the inclusion of single-line businesses. Because expenses are expressed on a per-line basis, there should not be a significant

43. 47 U.S.C. §254(k)

44. *Universal Service Decision*, at 148.

45. *Id.*, at 157.

46. Comments filed by Pacific Bell, US West, and Sprint, January 8, 1997, Docket 96-45, at Attachment 10, page 3.

difference in the ultimate per-line figure, yet it is conceivable that ILECs would "back-door" in expenses that have more to do with their provision of Centrex and serving large businesses than with single-line-businesses.[47] Therefore, detailed data should be provided in support of the BCPM's proposed expenses. Before aggregate expenses are translated into per-line data, the FCC should examine the proposed categories and ensure that the activities do not disproportionately support large businesses and/or the overall competitive strategy of a company. If such an examination does not occur, competitors will be paying for the ILECs' provision of competitive services through an oversized USF, overpriced access, and overpriced unbundled elements.

The BCPM Sponsors indicate that they have based their per-line non-plant-related expenses on responses to surveys sent to several ILECs in which the ILECs were asked to project their forward-looking expenses.[48] The survey questions and the complete responses should be forwarded to the FCC to see the parameters that influenced the way that the respondents "looked forward." Detailed workpapers should be submitted showing the calculation of per-line expenses.

The ILECs also estimated their "forward-looking" plant-related expenses such as central office switching expenses, network operations, and outside plant. As is the case with the non-plant-related expenses, the underlying data (i.e., the responses to the BCPM Sponsors' surveys, and the surveys themselves) should be provided to interested parties.

Moreover, the BCPM Sponsors contend that marketing may increase over time in a competitive market.[49] The FCC should not roll out a red carpet for ILECs to *increase* the marketing expenses that are reflected in a cost proxy model.

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47. Because of ILECs' interest in attracting and retaining large businesses and Centrex customers, there is likely to be a disproportionate level of customer and corporate support for these businesses than for single-line businesses. Data filed in a Massachusetts DPU proceeding is evidence of this pattern. ETI August Report, at pp. 105-110.

48. *Response of Pacific Bell, Sprint and US West to Public Notice of December 12, 1996* (DA 96-2091), CC Docket No. 96-45, January 7, 1997, see letter from Pacific Bell, Sprint and US West to William F. Caton, Secretary, F.C.C., at Attachment 10 at 1.

49. *Id.*, at answer to Question 16.

3 NETWORK DESIGN

3.1 Loop Plant — Feeder and Distribution

The BCPM and Version 3 of the Hatfield Model use the same general methodology for modeling the local exchange portion of the outside plant as was used by their respective predecessors. Both models continue to assign individual Census Block Groups (CBGs) to actual wire center locations and build out a network that is capable of providing the service outlined in the Joint Board's Recommended Decision. The section which follows briefly describes the design of the local exchange portion of the outside plant for both models and identifies some of the issues which require further analysis. These preliminary observations have been gleaned from ETI's initial analysis of the models and from documentation filed by the model developers in the first week of February.

Feeder Plant

The BCPM's methodology for the deployment of feeder plant is exactly the same as that of the BCM2. Similarly, there has been only one minor adjustment made in the Hatfield Model's approach to the deployment of feeder plant. Both models continue to assume that main feeder plant emanates from each central office site along four main feeder routes, provided that there are CBGs to be served in each of the resulting switch quadrants.[50] In both models, the main feeder route may contain both fiber and copper feeder plant and each feeder segment is sized to serve the capacity requirements of CBGs further out along the same main feeder route. The main feeder segments are distinguished by the points at which dedicated sub-feeder segments branch off the main feeder at ninety-degree angles to serve individual CBGs. CBGs directly in the path of the main feeder route do not require sub-feeder plant. In the BCPM, as in the BCM2, sub-feeder plant terminates at the edge of the CBG unless the distribution requirement triggers the extension of feeder

50. The switch quadrants are the area bounded by imaginary lines which extend at forty-five degree angles on either side of each main feeder route. Each wire center has four quadrants and all CBGs in a quadrant are served by the same main feeder route.

plant inside the CBG.[51] Whereas Version 2.2.2 of the Hatfield Model terminated copper and fiber feeder plant at a point half-way between the CBG's edge and centroid, the Hatfield Model 3 now terminates fiber feeder plant at the CBG's centroid.[52]

The BCPM has also adopted without change the BCM2's so-called "copper/fiber crossover algorithm" or the decision rule which assigns either copper or fiber feeder plant to a CBG. The BCPM assigns copper main feeder to CBGs which have a total loop length, as measured by the feeder and the maximum distribution distance, that is less than the user-specified copper/fiber breakpoint, and which have a capacity requirement that is less than the capacity of the maximum size distribution cable. CBGs with a loop length in excess of the breakpoint (which is 12,000 feet by default) or with a capacity requirement that exceeds the capacity of the largest size distribution cable are served by fiber feeder plant. Fiber fed CBGs with fewer than 240 lines per remote terminal are served by small DLC and those with greater than 240 lines per remote terminal are served by large DLC.

The Hatfield Model 3 has similarly adopted the same copper/fiber crossover algorithm as was used by its predecessor, Version 2.2.2. The Hatfield Model 3's copper/fiber crossover algorithm assigns copper feeder plant to CBGs which have a total feeder distance that is less than the user-specified breakpoint distance. The default copper/fiber breakpoint distance is 9,000 feet. It must be remembered that the BCPM includes both the feeder length and the "maximum distribution distance" in the loop length that is referenced by the copper/fiber crossover algorithm, while the Hatfield Model references the feeder length only. This explains in part why the default crossover point in the Hatfield Model is 9,000 feet, while the BCPM default crossover point is 12,000 feet.

ETI found in its analysis of the BCM2 and Version 2.2.2 of the Hatfield Model that the former served a greater percentage of CBGs with fiber feeder plant than was served by the latter. Based on comparable data sets,[53] the BCM2 served 59% of the CBGs with fiber feeder while the Hatfield Model served 53% of the CBGs with fiber feeder.[54] We have not yet undertaken this analysis with the BCPM and the Hatfield Model; however, we expect that this pattern will continue given that the copper/fiber crossover algorithms have not changed. The copper/fiber crossover algorithm merits special scrutiny for two reasons. First, the models must deploy a network that is capable of meeting the service requirements outlined by the Joint Board, that is, basic single-line residential and business local exchange

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51. Feeder plant is extended inside the CBG when the CBG's "maximum distribution distance" is greater than the user-adjustable "maximum copper distribution distance" which has a default value of 12,000 feet.

52. The Hatfield Model continues to terminate copper feeder plant at the point half-way between the CBG's edge and centroid.

53. The analysis was limited to BOC-served CBGs in Washington State.

54. Baldwin, Susan M. and Lee L. Selwyn, *Continuing Evaluation of Cost Proxy Models for Sizing the Universal Service Fund*, October 1996, Docket 96-45, at 67-71.

service. The network required for this level of service is distinct from the "fiber-intensive" and more costly broadband networks that many ILECs are choosing to deploy. Second, in our August Report,[55] we determined that although the BCM2 provides four options for the copper/fiber crossover point, the default value of 12,000 feet was not the most economically efficient based upon the other default values (e.g., costs of copper and fiber, electronics, etc.). The most efficient selection, based upon the BCM2 default values, is over 18,000 feet.[56] This phenomenon indicates that the BCPM's input costs and copper/fiber crossover algorithm are not internally consistent. We have tested the internal consistency of the Hatfield Model 3's copper/fiber crossover algorithm by raising the default crossover point of 9,000 feet by 3,000 foot increments and by lowering the crossover point to 6,000 feet. These sensitivity runs yielded average monthly costs for Washington State which in all cases were higher than the default average monthly cost (with the exception of one run which yielded a negligible difference). Therefore we tentatively conclude that the Hatfield Model 3's default inputs yield an economic copper/fiber crossover point at approximately 9,000 feet of feeder plant. This analysis has not yet been performed for the BCPM.

Table 3.1

Sensitivity Analysis of the Copper/Fiber Crossover Point for the Hatfield Model, Release 3

Exhibits Similar Patterns to Analysis of Hatfield Model 2.2.2
Washington State, Pacific Northwest Bell Only

	Monthly Cost	
Crossover (in feet)	**HM 2.2.2**	**HM3**
6,000	$17.46	$18.55
9,000	$17.51	$18.62
12,000	$17.79	$18.93
15,000	$18.15	$19.34
18,000	N/A	$19.84

55. ETI August Report, pp. 71-75.

56. ETI August Report, p. 74

Distribution Plant

The BCPM makes the same assumptions with respect to distribution plant as were made by the BCM2 with one minor exception. The BCPM now reflects the presence of multi-unit dwellings through a "Density Household Table." This table assigns a percentage of households which are single family and an average number of households per multi-unit dwelling to each of the BCPM's seven household density zones. This user-adjustable table serves to decrease the number of lots in each CBG and according to the model developers, permits a more accurate assessment of the drop, NID and terminal investments.[57]

The distribution architecture of the BCM2, and now of the BCPM, was touted by its developers as ensuring that distribution plant extended along each lot line in the CBG such that every household would be served. The BCM2 Sponsors criticized Version 2.2.2 of the Hatfield Model for using what they claimed to be an oversimplified distribution architecture, which failed to deploy adequate amounts of distribution plant in more densely populated CBGs. Version 3.0 of the Hatfield Model now uses a "tree and branch" distribution topology which appears more similar to the BCPM than before and which is far more sophisticated than the methodology used in earlier versions of the Hatfield Model. The Hatfield Model's enhanced distribution architecture relies in part on an expanded set of household density zones and on a measure of the percent of land space in each CBG which is unoccupied. Version 2.2.2 of the Hatfield Model included six household density zones while version 3.0 includes 9 household density zones.[58] Moreover, Table 3.2 below shows that the household density zones of the Hatfield Model version 3 no longer match those of the BCPM, which have changed as well.

57. BCPM filing, January 31, 1997, CC Docket 96-45, Attachment 9, p. 148.

58. The second smallest household density zone in version 2.2.2 — 5 to 200 households — has been split in two in versions 3.0. In addition, two new density zones have been created out of what used to be the largest household density zone (i.e., greater than 2,550).

Table 3.2 **Comparison of BCPM and Hatfield Model 3 Density Zones** (lines/sq. mile)	
Hatfield Model 3 Density Ranges	**BCPM Density Ranges**
0-5	0-10
5-100	11-50
100-200	51-150
200-650	151-500
650-850	501-2,000
850-2,550	2,001-5,000
2,550-5,000	5,001+
5,000-10,000	
10,000+	

The Hatfield Model now divides each CBG into four quadrants and then reduces the land area for each quadrant uniformly by the percent of the CBG which is unoccupied. After reducing the CBG's land area by excluding unoccupied space, the Hatfield Model assumes that the households in each CBG are located in either two or four clusters. For CBGs in the smallest three density zones, density zones 1-3, and with greater than 50% of the land area unoccupied, 85% of the customer locations are assumed to be clustered in the center of two quadrants. The size of the distribution cluster is determined by the average lot size per customer location and the distribution plant is deployed to the cluster area using a tree and branch distribution topology.[59] The remaining 15% of the customer locations for these CBGs are assumed to be located outside of the distribution grids and are served by extending distribution cable along the calculated lot frontage. Variations of the this same methodology are used to design the distribution plant for CBGs in the smallest three density zones which have less than 50% unoccupied space and for CBGs in the six larger household

59. Two backbone distribution cables are now assumed to begin at each Service Area Interface (SAI) in the CBG and extend vertically to a point within one lot depth of the top and bottom of the CBG boundary. Smaller distribution cables branch off each backbone distribution cable at ninety degree angles to a point within one lot width of the left and right boundaries of the CBG.

density zones. The impact of these enhancements to the Hatfield Model's distribution plant architecture requires further analysis.

Technical feasibility and policy issues raised by long loops

According to the BCPM sponsors, extending copper plant beyond 18,000 feet requires the use of load coils to control and/or eliminate crosstalks but that the use of such "load coils negatively impacts the use of 'mid-range' modems which transmit data at 9.6 - 28.8 kbps."[60] Thus the longest copper/fiber crossover point available in the BCPM is 18,000 feet and the default "Maximum Copper Distribution Distance" is an even shorter 12,000 feet. The engineering/economic debate goes something like this: The Hatfield Model sponsors point out that copper has served long loop lengths for approximately one hundred years, and thus actual experience demonstrates that there is no technical limitation to the use of copper for long distances. By contrast, the BCPM sponsors assert that service quality is degraded, that today's modems transmit data at 9.6-28.8 kbps, and that this speed cannot be guaranteed at copper loop lengths in excess of 18,000 feet. However, unlike in the earlier Hatfield Model release, the Hatfield Model 3 now uses a coarser gauge of cable and deploys load coils for copper loops that are longer than 18,000 feet.

A modem speed of 9.6 kbps to 28.8 kbps is a reasonable expectation, but other than US West's assertion, there is no evidence in support of US West's contention that it cannot be handled over copper loops that are longer than 18,000 feet. The critical question is whether, with the proper conditioning, this speed of data transmission can be reliably provided if a copper extends beyond 18,000 feet, and thus whether a network so-configured would satisfy this service quality objective.[61] This is an *engineering* question that should not be difficult to address and should be informed by experience "in the field" — either data can be transmitted over a properly conditioned copper distribution leg of greater than 18,000 feet using a mid-range modem or it cannot. In instances such as this, the FCC may need to simply go beyond the conflicting rhetoric among the sponsors' engineers and do "real-life" tests in locations identified by and agreed to by the various model sponsors.

However, in considering the engineering constraints, it is critical to distinguish between those constraints that relate to providing a specified level of quality (e.g., the engineering that is required to provide a minimum desired data transmission speed) and the engineering *practices* of ILECs. Some argue that the fact that an ILEC has been deploying fiber

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60. BCM2 Sponsors' Ex Parte Filing of October 30, 1996, CC Docket 96-45.

61. The BCM2 sponsors' assertion that data transmission quality suffers at distribution distances of *above 18,000 feet* raises the question of why the BCPM Sponsors set a default of only *12,000 feet* as the maximum distribution distance.

extensively in the network is evidence that it is economic to do so.[62] This is unpersuasive logic that if followed would simply reward an ILEC for investment in plant that has nothing whatsoever to do with the services in question. Such a conclusion reflects undue optimism about the ability of a regulator to detect cross-subsidization between a carrier's monopoly and competitive services. The ubiquitous deployment of fiber in the feeder by an ILEC could simply reflect the establishment by a regulator of an inadequate X factor that leaves the ILEC with excess earnings to roll back into the network for strategic purposes. The fact that an ILEC has been following this practice for a number of years does not mean that it is an *economic* practice for the narrowband services in question — the company's engineering practice may well be economic for the carrier's overall integrated strategic business interests, which likely encompasses plans to offer competitive services, broadband services, video services, but this does not translate into a conclusion that the practice is economic for basic services.

Accordingly, the FCC should reach an independent decision as to the engineering and economic factors that should guide a theoretical forward looking model's deployment of copper and fiber in the outside plant.

3.2 Decisions as to the appropriate demand data to incorporate should be linked to decisions regarding the fill factors

The Hatfield Model (both the previous version and Hatfield Model 3) and the newest BCPM include 1995 census estimates (the BCM2 relied on 1990 census counts). It is certainly appropriate to incorporate the most recent demand data available in a cost proxy model. Staff appropriately recommends that models include the total demand for telecommunications because the "exclusion of any lines may lead to an overestimation of per-line costs when economies of scale and scope are present in the delivery of telecommunications services."[63] Staff also raises the concern that "the use of current demand, such as that found in ARMIS, rather than a forecast of demand over the service life of the network may lead to significant modelling inaccuracies."[64] If current demand is used, then fill factors should be established accordingly, i.e., they should not be set for the purpose of accommodating *future* growth. Conversely, if low fill factors are selected, then *future* demand should be used in the model.

62. See, e.g., *Mass. Arbitration Decision*, at 16, which relies in part on NYNEX's testimony "that, for five years, the company's application guideline has been to install fiber in the feeder component of the loop (Tr. 8, at 307). Thus it has actually been installing fiber in the feeder, and so its model is not attempting to create a fictitious forward-looking view of the network."

63. Staff Report, at ¶ 28.

64. *Id.*

The stayed *Local Competition Order* states that a network should be sized "for reasonably foreseeable capacity requirements."[65] In any event, a cost proxy model should match the sizing of the capacity with the supply so that unit costs are properly computed: if investment costs are inflated in order to "efficiently" provision future demand, then that future demand should be used in the calculation of unit prices.

3.3 The fill factors should be set to provide spare capacity for administrative and maintenance purposes

The Hatfield Model 3 includes a new feature that computes the *actual* fill resulting from the theoretical network that the model "deploys." This is a desirable attribute of a cost proxy model because the calculation will help to underscore the critical difference between design and achieved fill factors. The two following tables that are based upon runs of the Hatfield Model 3 illustrate the significant gap between design (sometimes called objective) fill and actual (or achieved) fill.

65. *First Interconnection Order*, at ¶ 685.